If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

15.3.2.3 Booster Magnet Final Test Procedure

(Booster/AGS Ring Power Supply Systems Group Procedure EPS-B-003)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

M. Bannon

Booster/AGS Ring Power Supply Systems
Group Procedure EPS-B-003
Revision 00

15.3.2.3 Booster Magnet Final Test Procedure

Date: _____ Rev. _____

Test Performed By:_____

Location: _____ ½ CELL [ ] ¼ CELL [ ]

Dipole Serial Number: _____

Quad Serial Number: _____

Sextupole Serial Number: _____

Correction Magnet Serial Number: _____

COMMENTS:

_____

_____

_____

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SECTION I - VISUAL INSPECTION

This part of the final test is performed in accordance with BNL Safety Manual Section 1.5.0 AS A Class A, Mode 1 Operation. All operations are too performed in a positively de-energized state. Check all terminal strips and bus bars for tightness and correct wiring as per Dwgs.

PART 1 Visual and Mechanical Tightness
Using a screw driver on all terminal strips check to see screws are all tight.
Using wrench on all bolts check all bolt connections.

1. Dipole Upper Eddy Current Terminal Strip.		[ ]
2. Dipole Lower Eddy Current Terminal Strip		[ ]
3. Dipole Trim Bus Bars.		[ ]
4. Dipole Main Bus and Quad Bus Bars.		[ ]
5. Correct Bus Orientation as per sketch.		[ ]
6. Quad Tune Bus Bars		[ ]
7. Quad ½ Interger Terminal Strips		[ ]
8. Quad ½ Interger Orientation as per Dwg.		[ ]
9. Quad Monitor Winding Terminal Strips		[ ]
10. Sextupole Main Bus and Water Conn.		[ ]
11. Sextupole 1/3 Interger		[ ]
12. Sextupole Monitor Winding		[ ]
13. Sextupole 9^{th} Harmonic		[ ]
14. Correction Magnet Terminal Strips	[ ] VERT [ ] HORZ.	[ ]
15. Skew Quad Terminal Strips		[ ]
16. 14^{th} Harmonic Skew Sextupole		[ ]
17. Dipole Trim Klixons		[ ]
18. Dipole Main Klixons		[ ]
19. Quad Main Klixons		[ ]
20. Quad Tune Klixons		[ ]
21. Sextupole Main Klixons		[ ]
22. Cell Flow Switch		[ ]
23. Magnet Interlock Box inside Connections		[ ]

SECTION II - LOW LEVEL TEST

This part of final test is performed in accordance with the BNL Safety Manual Section 1.5.0 AS A Class A Mode 2. All manipulative actions are to be performed with equipment positively de-energized.

1. Attach test box to magnet interlock box. Check for proper fault when Klixons are opened.
   A. Test Dipole Bump Upper Klixon. [ ]
   B. Test Dipole Bump lower Klixon [ ]
   C. Test Dipole Main Upper Klixon [ ]
   D. Test Dipole Main Lower Klixon [ ]
   E. Test Two Quad Klixons [ ]
   F. Test Quad Trim Two Klixons [ ]
   G. Test Sextupole Two Klixons [ ]
   H. Verify Flow Switch [ ]

SECTION III - HI POT TESTING

This part of the final test is performed in accordance with the BNL Safety Manual Section 1.5.0 as a Class B, Mode 2. All manipulative actions are to be performed with equipment positively de-energized. Two persons must be preset at all times during test. Lethal potentials are developed between magnet coils and the frame thoroughly clean off girder frame and remove all debris before starting test. This test establishes a minimum insulation resistance of 10 Megohms to ground

1. Tie all magnet coils to girder except the magnet coils that will be tested.

2. Ground girder to building ground.

3. Attach ground stick to girder.

4. Lay out monitor windings so they do not arc to girder during test if they are not terminated inside magnet Int. Lock Box during test.

5. **TEST 1 (Correction Dipole Magnet)**
   Attach 500 VDC megger + lead to correction magnet terminal strips and the – lead to ground and record magnet resistance to ground _____ MEG ohms

6. **TEST 2 (Correction Dipole Magnet-Skew Quad)**
   Attach 500 VDC megger + lead to skew quad magnet terminal strips and the – lead to ground and record magnet resistance to ground _____ MEG ohms
7. **TEST 3 (Correction Dipole Magnet- 14^{TH} Harmonic Skew Sextupole)**
   Attach 500 VDC megger + lead to 14^{th} harmonic skew sextupole magnet terminal strips and the – lead to ground and record magnet resistance to ground _____ MEG ohms.

8. **TEST 4 (Sextupole 1/3 Interger ,Monitor & 9^{TH} Harmonic Windings)**
   Attach 500 VDC megger + lead to sextupole magnet terminal strips and the – lead to ground and record magnet resistance to ground _____ MEG ohms
   (Short 1/3 interger sextupole windings and monitor winding (9^{th} harmonic winding all together for one test of all windings)

9. **TEST 5 (Sextupole Main Magnet)**
   Attach 500 VDC megger + lead to sextupole magnet and the – lead to ground and record magnet resistance to ground _____ MEG ohms

10. **TEST 6 (Quad Trim Winding)**
    Attach 500 VDC Megger + lead to the quad trim winding and the – lead to ground and record magnet resistance to ground _____ MEG ohms

11. **TEST 7 (½ Interger Quad and Monitor Winding)**
    Attach 500 VDC megger + lead to the ½ interger quad winding and the – lead to ground and record magnet resistance to ground _____ MEG ohms
    (Short 1/2 Interger Quad Winding and Monitor Winding

12. **TEST 8 (Dipole Trim & Monitor Windings and Eddy Current Windings)**
    Attach 500 vdc megger + lead to the dipole trim winding and the – lead to ground and record magnet resistance to ground _____ MEG ohms
    (Short dipole trim windings monitor windings and eddy current winding together)

Note:
Only megger test will be performed do not hipot

13. **TEST 8 (Dipole Bump Winding)**
    attach 500 VDC megger + lead to the dipole bump winding and the – lead to ground and record magnet resistance to ground _____ MEG ohms

14. **TEST 9 (MAIN DIPOLE AND QUAD MAGNETS)**
    attach 500 VDC megger + lead to the main dipole and quad bus work and the – lead to ground and record magnet resistance to ground _____ MEG ohms

    attach the + lead of hi-pot to main dipole and quad bus work and the – lead of hi-pot to and. bring hi-pot up to 3500 volts for 1 min and record leakage current. _____ 1.0 MA max.

15. After test is complete turn off hi-pot and ground magnet with and stick. then ground magnet to girder.

16. Remove all ground from magnets

SECTION IV - MAGNET POLARITY CHECK

1. Using a Power Supply – Power the Anderson Connectors with a few amps (10 amps or less) and record the voltage drops on each magnet coil and polarity (refer to Dwgs. Of each magnet being powered and verify readings are correct.)
   (Refer to Dwgs. of each magnet, begin powered and verify readings are correct.

   A. Dipole Correction Magnet

   B. Skew Quad (Correction Magnet)

   C. 14^{TH} Harmonic Skew Sextupole

   D. Sextupole Monitor Winding

   E. Sextupole 9^{th} Harmonic Winding (same as Sextupole monitor except for the Anderson connectors)

   F. Sextupole 1/3 Interger

   G. Quad ½ Interger

   H. Quad Tune Trim Winding

   I. Quad Monitor Winding

   J. Dipole Monitor Winding

Booster Cell Configuration Location:_____

1/2 CELL [ ]

1/4 CELL [ ]

A.) DIPOLE

1)	Main Dipole Horz. [ ] Assembly	Dwg. D36-M-0928-5
2)	Dipole Bump Horz. [ ] Vert. [ ] N/A [ ]	Dwg. D36-E740-2
3)	Monitor Winding-Dipole	Dwg. D36-E738-2
4)	Dipole Eddy Current Winding	Dwg. D36-E749-4 (3 OF 3)

B.) QUAD

1)	Main Quadrupole Horz. [ ] Vert. [ ]	Dwg. D36-E741-2
2)	Quad Trim Focus (Horz.) [ ] De-Focus (Vert.) [ ]	Dwg. D36-E742-2
3)	½ Interger Quad Focus (Horz.) [ ] De-Focus (Vert.) [ ]	Dwg.D36-E743-2
4)	Monitor Winding-Quad	Dwg. D36-E744-2

C.) SEXTUPOLE

1)	Main Sextupole Focus (Horz.) [ ] De-Focus (Vert.) [ ]	Dwg. D36-E748-2
2)	(NI) 1/3 Interger Sextupole (A1-A8,D1-D8) Focus (Horz.) [ ] De-Focus (Vert.) [ ]	Dwg.. D36-E746-2
	(N/2 I) 1/3 Integer Sextupole Focus (Horz.) [ ] De-Focus (Vert.) [ ] (B1-B8, E1-E8,C1-C8,F1-F8)	Dwg. D36-E747-2
3)	Monitor Winding -Sextupole	Dwg. D36-E745-2
4)	9^{TH} Harmonic Sextupole (Uses Monitor Winding)	

D.) CORRECTION MAGNET

1)	Closed Orbit Dipole (Correction Magnet) Bend (Horz.) 2,4,6,8's [ ] Pitch (Vert.) 1,3,5,7's [ ]	 Dwg. D36-E750-2 Dwg. D36-E751-2
2)	SKEW QUAD Horz. [ ] Vert. [ ]	Dwg. D36-E749-2
3)	14^{TH} Harmonic Skew Sextupole	Hand Drawn Copy

E. MAGNET FAMILIES

1)	½ Int. Stop Band Quad Families	Dwg.	D36-E743-3
2)	1/3 Int. Stop B and Sext. Families	Dwg.	D36-E752-2
3)	Closed Orbit Dipole & PS	Dwg.	D36-E758-3
4)	Main Sextupole Families	Dwg.	D36-E755-2
5)	Quad Tune Trim Families	Dwg.	D36-E756-2